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ABSTRACT

The use of stepwise discriminant analysis as a means to select entering students who would benefit from a special program for the disadvantaged was studied. In fall 1984, 278 full-time black students were admitted as first-time students to a large urban university. Of the total, 200 entered a special program for the disadvantaged and 78 entered directly into the college. Three precollege variables were entered into the stepwise discriminant analysis: Scholastic Aptitude Test (SAT) verbal score, SAT math score, and high school rank. In addition, a second discriminant analysis was run to determine whether the originial placement was correct. The analysis indicated that the characteristics of the majority of black freshmen who entered college directly in fall 1984 differed from the majority who began the special program, but there was some overlap in both groups. The results indicate that 30 students from the special program should have been regular entry, and 18 regular entry students should have been in the special program. Based on the three precollege variables, guidelines for future placement of entering the program for the disadvantaged or directly into the college were established. (SW)

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DISCRIMINANT ANALYSIS AS A TOOL FOR ADMISSION SELECTION TO SPECIAL ACADEMIC PROGRAMS

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Ann K. Dickey, Chair
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DISCRIMINANT ANALYSIS AS A TOOL FOR ADMISSION SELECTION TO SPECIAL ACADEMIC PROGRAMS

Abstract

In this study, stepwise discriminant analysis was demonstrated as a useful tool for selecting entering students who would benefit from a special program for the disadvantaged. In the fall 1984, 278 full-time black students were admitted as first-time students to a large urban university. Of the total, 200 entered a special program for the disadvantaged and 78 entered directly into the college. Based on the SAT math scores, SAT verbal scores, and class rank of these entering students, guidelines for future placement of entering students, either with the program for the disadvantaged or directly into the college, were established.

DISCRIMINANT ANALYSIS AS A TOOL FOR ADMISSION SELECTION TO SPECIAL ACADEMIC PROGRAMS

Over the years and especially since the 1960s, special and remedial programs have been established in our colleges and universities for entering students who lack the traditional entry requirements. Today open admission colleges are not at all uncommon. How successful are the special programs for the high-risk college students? There is sufficient evidence in the literature to indicate that many of these programs have been very successful. For example, a recent report of a meta-analytical synthesis of findings from sixty evaluation studies showed that basically positive effects on high-risk and disadvantaged students resulted from special college programs (C.-L. C. Kulik, J. Kulick, and Shwalb, 1983).

Quite often the special programs offered at colleges and universities with traditional entry requirements serve a dual purpose. They are designed to overcome both academic and socioeconomic deficiencies in order to give potentially capable students a chance at higher education. A large percentage of the disadvantaged who participate in these programs are, of course, black. Overall, studies have shown that blacks have a higher attrition rate and a slower progression rate than whites (Astin, 1975; Gosman, Dandridge, Nettles, and Thoeny, 1983). This is not to imply, of course, that all blacks should be in programs for the disadvantaged. Astin (1973) found that differences between blacks and whites tend to disappear when their academic backgrounds were the same. Gosman et al. (1983) reported similar findings. Their study showed that when the effects of other variables were statistically controlled, blacks with high SAT scores and high family incomes at predominately black universities consistently had low attrition rates and high progression rates.

benefit most from a special program for the disadvantaged at a university with The purpose of this study was to provide a selection process, based on precollege academic characteristics, for determining which students would traditional entry requirements.

In 1968 at a large urban university, an Office of University-Community Educational Programs (U-CEP) was established. The U-CEP Office designed a program that offers an educational opportunity to students who otherwise would not have the chance to enter college. Students chosen for the program typically come from minority groups. Participants in the program are those who have given some indication that they have academic potential, but they lack the qualifications and skills to enter college directly as first-time, full-time freshmen. The purpose of the U-CEP curricula is to develop the student's cognitive abilities and enhance his social growth. The U-CEP program through special classes and counseling assists the students in eliminating prior deficiences and prepares them for college-level work. U-CEP courses are taught by special instructors and a teacher-counselor is assigned to each student to provide social and academic support during the student's first year of matriculation. In addition, students are given financial aid to assist them with their personal and academic expenses. The biggest drawback with the program for the student is that it usually requires five academic years to graduate rather than the usual four years because of the slower pace and the additional U-CEP courses.

Statement of the Problem

Currently, black students are admitted to either the U-CEP program or directly into regular college programs, depending upon their entering characteristics. Because of the economic benefits that a U-CEP student receives, a

question arose as to whether there is a difference between the entering characteristics of U-CEP admits and regular black college admits. The argument was that if there was no difference, there should be more U-CEP admits and fewer black regular admits so that more black students would receive the economic benefits that the U-CEP program provides. Was there a difference between the entering characteristics of the two groups of black students? This was the question that this paper addressed.

Hypothesis

There is no difference between black students who enter college directly as first-time, full-time students and those who enter the U-CEP program.

Population

The population included all black students who entered the University as first-time, full-time freshmen in Fall 1984. The total number was 278 black freshmen. Of the total population, 78 black freshmen registered full-time in the regular college program and 200 were admitted to the U-CEP program.

Methodology

Discriminant analysis was the statistical technique used in this study. Discriminant analysis is a statistical procedure that determines whether there is a difference between groups and which variables distinguish the groups best. The groups of cases belonging to each group are predetermined by the researcher. In this study, there were two groups, U-CEP black freshmen and regular entry black freshmen. A stepwise discriminant analysis was performed on these two groups, whereby three precollege variables were entered into the

analysis in a stepwise fashion depending upon their discriminating power. The variables entered into the analysis were:

1. SAT verbal score

2. SAT math score

3. High school rank converted to a standard score based on class size.

These three precollege variables were chosen because they were standardized variables, and they were available for most of the students in the population prior to entering. A review of the literature led Pantages and Creedow (1978) to state that academic variables, such as high school GPA and class rank, were strong single-variable predictors of persistence and attrition. Using path analysis to study dropout characteristics, Munro (1981) concluded high school academic performance was a better predictor of college academic performance than aptitude test scores for vocabulary, reading, letter groups, and mathematics. Hanford (1985) demonstrated in his analysis of high school rank and SAT scores that when taken in combination, these two variables play a confirming role in predicting success in college.

The means and the standard deviation for each of the three variables for each group and the total population are shown in Table 1. In addition, the cumulative quality point average (QPA) earned the first term after entering was determined. Cases that had missing data for the variables SAT verbal, SAT math, and standard high school rank were assigned the group mean for the variable missing. All data were obtained from the Office of Admissions and Student Aid.

Since the three above variables were entered into the discriminant analysis in stepwise fashion, the most discriminating variable was entered into the analysis first. Of the three variables, the SAT verbal scores entered first, and the distance between the group centroids was computed. The

Table 1

Group Means and Standard Deviations

	U-CEP N=200		Regular Entry N=78		Total N=278	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
SAT Verbal	345	64	420	86	367	79
SAT Math	371	63	425	84	387	74
Standard Rank	51	8	58	7	53	8
QPA*	2.23	0.71	2.02	0.85	2.17	0.76

*0.00 QPAs were not included, 20 U-CEP students and 2 regular entry students.

group centroids locate in reduced space the discriminant scores for each group as defined by the discriminant function. Since we have two groups, only one discriminant function is possible for this analysis. The second variable entered was the standard high school rank score, and the third was the SAT math. Each of the three variables did add to the discriminating power between the two groups. A test of the discriminating power of each variable is the Wilks' lambda criterion. As each variable was entered into the analysis, its contribution to discrimination between the groups was reflected in the resulting size of Wilks' lambda. The lambda declined in size as each variable was added, and this was an indication that the discriminating power increased. The resulting lambdas as each variable was added are listed in Table 2. Also listed in Table 2 is the large sample chi-square test associated with the final lambda, providing a test of statistical significance. The final lambda was 0.6319. From the results shown in Table 2, it was concluded that the null hypothesis that the two groups are similar could be rejected.

After the initial discriminant analysis was completed, a further technique was employed that examined each case to determine whether the original classification into U-CEP was correct. Some overlap had occurred, but 83.73 percent of the cases were correctly assigned. Table 3 shows the classification results based on the three variables of verbal SAT, math SAT, and standard high school rank.

A second discriminant analysis was run with the group classification changed for those cases designated as misclassified in the first discriminant analysis. This resulted in improving the correctly classified cases to 97.5%. Table 4 shows these final classification results.

From the discriminant analysis, a discriminant function with weighted coefficients for each variable is produced in a linear combination that can be

Table 2

Wilks' Lambda After Stepwise Entry and the Associated Chi-Square

Variable	Total Variables In	Wilks' Lambda	Signif-icance	Chi-Square	Degrees of Freedom	Signif-icance
Verbal SAT	1	0.8068	.0000			
Standard Rank	2	0.6500	.0000			
Math SAT	3	0.6319	.0000	125.99	3	.0000

Table 3

Results of Original Classification

Actual Group	Number of Students	Predicted Group Membership 1	2
U-CEP	200	170	30
		85.0%	15.0%
Regular Entry	78	18	60
		23.1%	76.9%

Table 4

Results of Corrected Classification

Actual Group	Number of Students	Predicted Group Membership 1	2
U-CEP	188	185	3
		98.4%	1.6%
Regular Entry	90	4	86
		4.4%	95.6%

used to compute a discriminant score for each student. The discriminant score for an individual locates that individual on a continuum between the two groups. The weighted combination of the variables of the discriminant function maximizes the distance between the group centroids. In the case of our analysis, the resulting discriminant function when the cases were reclassified was

$$D = 0.0121845V + 0.00749288M + 0.1327748R - 14.38567$$

where V is the verbal SAT score, M is the math SAT score, and R is the converted standard high school rank. For example, if a student's verbal SAT score was 330, the math SAT score was 360, and the standard high school rank score was 56, the discriminant score would be -0.2320. On the continuum in the reclassification analysis, students whose discriminant scores were lower than 0.4800 were assigned to the U-CEP group as the highest probability group classification, and those whose discriminant scores were above 0.4800 were assigned to the regular entry group or

Discriminant Score < 0.4800 = U-CEP Program

Discriminant Score > 0.4800 = Regular Entry

In our example, a student with a discriminant score of -0.2320 would be assigned to the U-CEP program. The above discriminant function can thus be used for the optimum placement of future first-time students in either the U-CEP program or the regular college program, based on the three entering characteristics.

Conclusion

This analysis indicated that the characteristics of the majority of the black freshmen who entered college directly in Fall Term 1984 (85-1) differed from the majority who began as U-CEP freshmen, but there was some overlap in

both groups. Based on the three variables examined in this study, the results indicated that thirty students in the U-CEP group should have been regular entry, and eighteen of the regular entry students should have been in the U-CEP program; however, the majority of the black, first-time freshmen were correctly placed. In the future, one should calculate the discriminant score based on the discriminant function

$$D = 0.0121845V + 0.00749288M + 0.1327748R - 14.38567$$

and assign first-time students to the U-CEP Program only if $D < 0.4800$.

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